ENGINEERING SOILS MAP OF WABASH COUNTY

MAY 1970 — NUMBER 9

BY

D. G. SHURIG

JHRP

JOINT HIGHWAY RESEARCH PROJECT
PURDUE UNIVERSITY AND
INDIANA STATE HIGHWAY COMMISSION

Final Report

ENGINEERING SOILS MAP OF WABASH COUNTY INDIANA

TO: J. F. McLaughlin, Director
Joint Highway Research Project

FROM: H. L. Michael, Associate Director
Joint Highway Research Project

May 27, 1970

File: 1-5-28-49

Project: C-36-51B

The attached report, entitled "Engineering Soils Map of Wabash County, Indiana," completes a portion of the project concerned with development of county engineering soils map of the State of Indiana. This is the 49th report in the series. The report was prepared by Professor D. G. Shurig, Joint Highway Research Project.

Most of the mapping was done by routine airphoto interpretation techniques. Available pedological data was limited to a small, generalized soil association map. A good glacial geology map was available to help outline major land forms.

Respectfully submitted,

Harold L. Michael

Harold L. Michael
Associate Director

HLM/rg

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Final Report

ENGINEERING SOILS MAP OF WABASH COUNTY

by

D. G. Shurig
Research Associate

Joint Highway Research Project
Project No: C-36-51B
File No: 1-5-28-49

Prepared as Part of an Investigation

Conducted by

Joint Highway Research Project
Engineering Experiment Station
Purdue University

in cooperation with the

Indiana State Highway Commission

Purdue University
Lafayette, Indiana
May 27, 1970

ENGINEERING SOILS MAP
OF
WABASH COUNTY, INDIANA

BY

D. G. SHURIG

INTRODUCTION

Development of an engineering soils map of Wabash County (in back cover pocket of this report) was the primary objective of this project. The purpose of the following report is to supplement the information appearing on the engineering soils map.

An important source of data used in this mapping project was Geological Survey Bulletin No. 5, "Glacial Geology of Wabash County, Indiana", by Wayne and Thornbury (10). Routine airphoto interpretation techniques were used to outline land form boundaries most of which were verified by the glacial geology map in Bulletin No. 5. A minimum of one day of field reconnaissance was also possible because of the availability of the Bulletin. The only pedological data available at the time of this report was a small preliminary type soil association map (1).

The photographs used were 9 x 9 in. contact prints at an approximate scale of 1:20,000. Date of photography was 1941.

The final land form and parent material boundaries were graphically reduced to produce the engineering soils map. Symbols were used to delineate the parent materials (grouped according to land form and origin). Textural symbols were then superimposed to indicate the relative

composition of the parent materials. The map also includes a set of soil profiles which indicate the general soil profiles of topographically high and low sites in each parent material area. Each profile shows the general range in depth and texture (ISHC textures) of each soil horizon.

DESCRIPTION OF AREA

GENERAL

Wabash County is located in north-central Indiana - see Fig. 1. The City of Wabash, the county seat, is located 80 miles northeast of Indianapolis.

County dimensions are 27 miles in the north-south direction and 16 miles east-west. Its area is 426 square miles.

Wabash County is important for farming but population figures below show that the rural population is not increasing as fast as the urban population (15).

Table I
Some Significant Population Data for Wabash County

Population Cities and Towns	Population 1950	Population 1960	Population Change '50-'60
LaFountaine	627	779	152
Largo	545	763	218
North Manchester	3977	4377	400
Roann	492	478	-14
Wabash	10621	12621	2000
Cities & Towns	16262	19018	2756
Rural Areas	12785	13587	802
County Total	29047	32605	3558

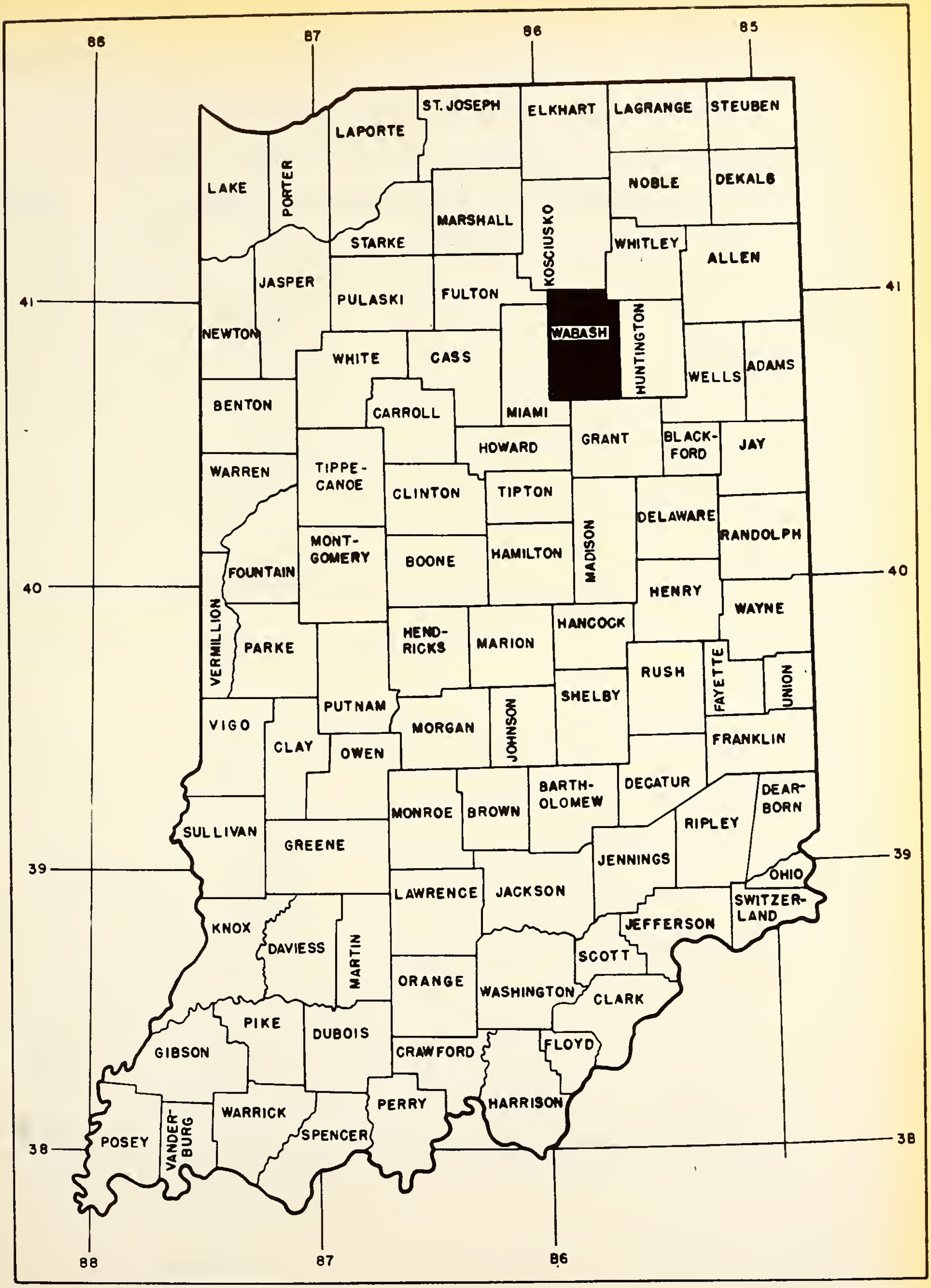


FIG. I. LOCATION MAP OF WABASH COUNTY

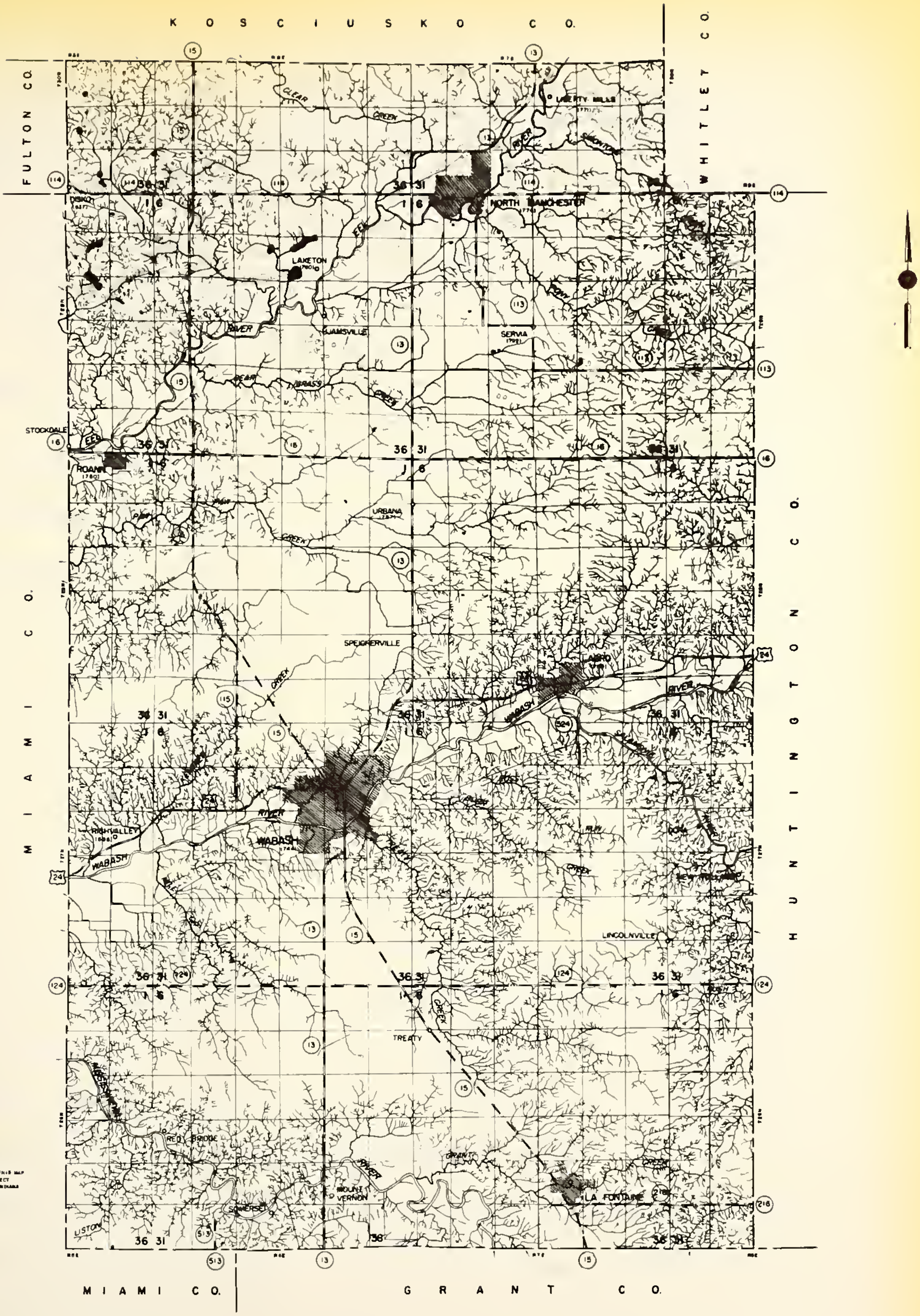
DRAINAGE FEATURES

Fig. 2 shows a drainage map of Wabash County (11). Wabash County id in the Wabash drainage basin of the State. Major tributary streams to the Wabash River, flowing from east to west across the center of the State, include the Eel river in the north and Salamonie and Mississinewa Rivers in the south.

The U.S. Army Corps of Engineers has constructed dams and reservoirs on both the Salamonie and Mississinewa Rivers in Wabash County. Locations of the dams and the extent of the flood pools are shown on the engineering soils map. Detailed information circulars are available on the two reservoirs (13) (14).

The following drainage information is quoted from the "Atlas of County Drainage Maps of Indiana - Wabash County"(11).

> "The Wabash River valley acted as a glacial sluiceway. The Wabash River flows through the surface expression of the buried Teays Valley near the town of Rich Valley. Some streams flow on rock in portions of their courses. Treaty Creek has a rock-walled valley near Wabash. Mill Creek contacts rock near the Wabash River. Terraces occur at intervals in the Wabash Valley. Drainage is best developed in the uplands adjacent the main streams. Crests of sections of moraines define watershed divides in the county. Some control on stream courses and some stream deflections can be attributed, at least partially, to the presence of the moraines. Drainage patterns vary from fine-textured in the eastern sections to haphazard in the northwestern morainic areas. The Wabash River crosses a morainic segment. Tributaries of Eel River have tortous courses, some through morainic areas. The angular bends of the Mississinewa River are noticeable. The rivers are entrenched; also, many small tributary streams in the southern part are entrenched. The course of Treaty Creek may be controlled in part by the Mississinewa moraine. Bear and Pawpaw creeks are nearly parallel.



NOTE REPORT DISCREPANCIES FOUND ON THIS MAP
TO JOINT HIGHWAY RESEARCH PROJECT
PURDUE UNIVERSITY, LAFAYETTE, INDIANA

DRAINAGE MAP
WABASH COUNTY

FIG. 2

> "There are several natural lakes in the northwest part of the county. Ponds of various origins are scattered over the area. Lakes tend to stabilize the flow of their outlet streams. Some lakes are connected by streams. The lakes have a variety of size, depth, and outline of shore.
>
> "Ditches have been constructed to improve sluggish drainage conditions in the till plain areas. Many morainic basins have been drained artificially".

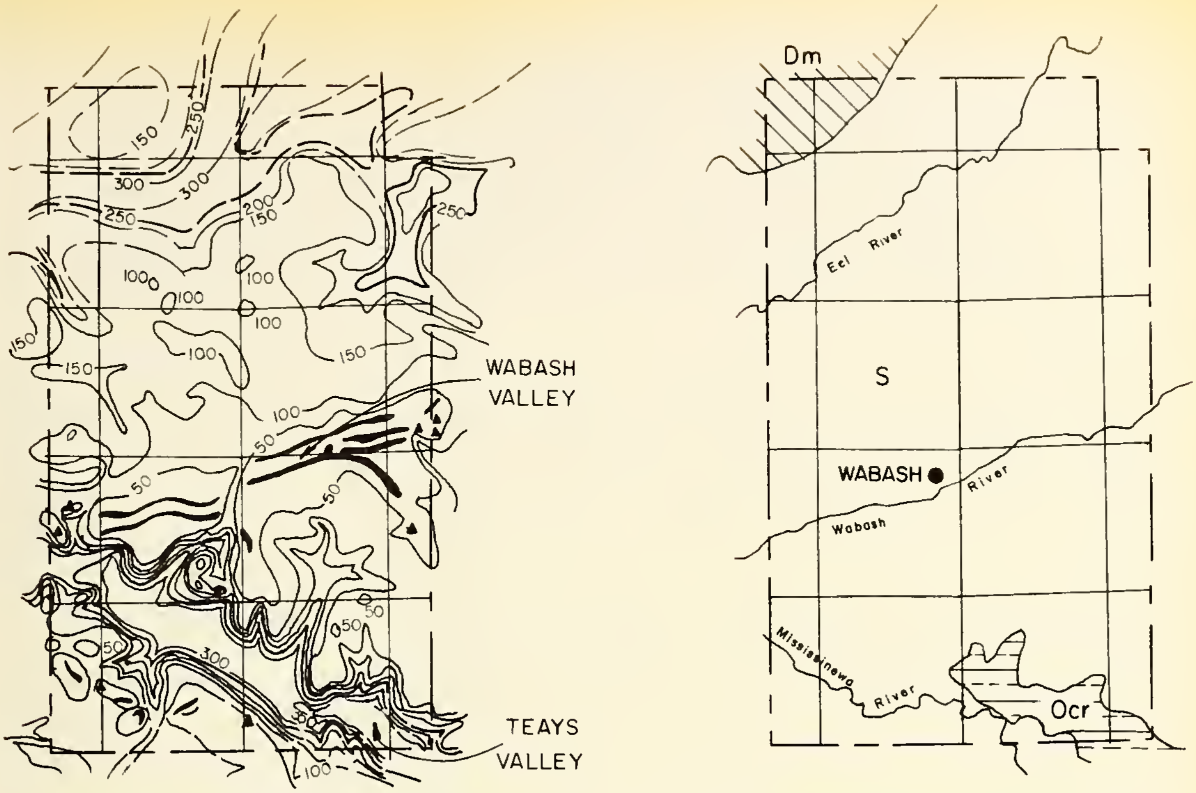
GLACIAL GEOLOGY

Wayne and Thornbury published a detailed report on the "Glacial Geology of Wabash County, Indiana" in 1951 (10). Information pertaining to engineering soils is summarized below.

Ice covered Wabash County during at least three glacial ages: Kansan, Illinoian and Wisconsin. The deepest stream cuts, however, expose only Wisconsin drift.

The glacial drift cover ranges from none, at bedrock exposures in some recent stream valleys to over 410 feet at several buried preglacial valleys - see Fig. 3 (9). The preglacial and interglacial Teays River was the main stream across the county. Much of the buried valley is about 300 feet below the general upland surface, and under a morainic ridge, it is 410 feet deep. In general, most of the drift is 75 to 100 feet deep under the till plains and several tens of feet deeper under the ridge moraines (9).

The Wisconsin Age of glaciation consisted of two subages, Tazewell the oldest and Cary the youngest. During the Tazewell subage the ice front moved back and forth across the county several times. This flucuation is indicated by several layers of outwash and weathered till exposed in some of the deeper stream cuts.



GLACIAL DRIFT THICKNESS
(WAYNE-1956)

50 Ft. Contour Interval

▲ ▬ Bedrock Outcrops

⚒ Quarry

BEDROCK GEOLOGY
(PATTON-1956)

S	Silurian Ls., Dolo., and Sh.
Ocr	Ordovician Ls. and Sh.
Dm	Middle Devonian Ls., Dolo., and Ss.

FIG. 3 GLACIAL DRIFT THICKNESS AND BEDROCK GEOLOGY OF WABASH COUNTY

> "The ice of the Erie lobe covered most of the county (Wabash & Miami) during the Tazewell subage. Leverett and Taylor (1915 p. 30) thought that the Union City moraine marked the outermost advance of the Erie Lobe during late Wisconsin time. .....Because recent work (Wayne and Thornbury, 1951, p.8) indicated that the Mississinewa moraine is the oldest of the Cary moraines in north-central Indiana, the Union City moraine is interpreted as a recessional moraine of the Erie lobe during late Tazewell time"(8).

After Tazewell time there was an interglacial period of 10,000 to 12,000 years. After this, the Cary subage began and it is thought that the farthest advance of the Erie Lobe, in Cary time, was to the Mississeneva ridge moraine.

The Packerton moraine in north-central Indiana has been considered by most persons who have studied it to be a large interlobate moraine between the Saginaw and Erie lobes. Wayne and Thornbury have reason to believe that part of the Packerton moraine south of Disko was built by the Erie lobe and the part north of Disko by the Saginaw lobe (8).

The Wabash Valley has a rather unique glacial history. The valley has three levels: an upper terrace, the Mississinewa terrace, a lower terrace called the Maumee terrace and a third and lowest level which is the recent flood plain. The upper Mississinewa terrace was formed in the late Tazewell subage and the early Cary subage. The lower Maumee terrace was formed in the late Cary subage when glacial lake Maumee broke through its ridge moraine dam -- near the present City of Fort Wayne. The relatively clear lake water was mostly degradational and cut a newer and lower terrace level. The two terrace levels can be traced all the way to the mouth of the Wabash River.

BEDROCK GEOLOGY

Most of the bedrock underlying Wabash County is Silurian of the Wabash Formation. Exposures along stream cuts include the cherty Liston Creek Limestone Member, the Mississinewa Shale Member and the Huntington Lithofacies (formerly called Huntington Dolomite).

> "The type exposures of the Liston Creek Limestone Member are found along Liston Creek near Red Bridge in southwestern Wabash County. Here and in adjacent counties where the lower part of the Liston Creek lies at the bedrock surface, it consists of light-gray and tan fine-to medium-grained fossil-fragmental cherty limestone and dolomitic limestone. Nodular and bedded chert is most characteristic. Where the member is exposed a slabby appearance is notable which is not seen in fresh cores. The fresh cores have thin green argillaceous laminae that appear to be glauconitic or chloritic.
>
> "The type exposures of the Mississinewa Shale Member are along the Mississinewa River in Wabash and Grant Counties where as much as 75 feet can be seen at one place (.....it actually is 110 feet thick here and about 200 feet to the north). The Mississinewa Member generally is composed of gray fine-grained argillaceous silty dolomite and dolomitic siltstone and minor amounts of pyrite and carbonaceous particles.
>
> "Reefs, bioherms, banks and upper Niagaran thick-bedded reef-detrital limestones and dolomites of northern Indiana that collectively have been called Huntington Dolomite (now Huntington Lithofacies) are for the most part facies of the Mississinewa Shale and Liston Creek Limestone Members"(5).

The erroding melt-water flowing down the Wabash, Mississinewa and Salamonie sluiceways uncovered many Silurian bioherms (reef rock formations). The resistant dolomite of these reefs was more difficult to erode than inter-reef rock and, in some places, unconsolidated drift — thus the old exhumed reefs became islands in the

sluiceways. Cumings and Shrock applied the name klint (pl. klintar) to the exhumed remnant of an ancient bioherm. The Maumee terrace and the present flood plain are studded with klintar, but only a few stand above the higher Mississinewa terrace - see the attached soils map (10).

> "The small dome-like structures that are found in the Silurian rocks of northern Indiana are called bioherms (organic mounds) or, less accurately, reefs. They are of Nigaran age and are associated intimately with the Mississinewa and the Liston Creek formations. The reefs are, in general, dome-shaped masses of dolomitic material which have massive, unstratified cores composed in part of the remains of stromatoporoids, corals, bryozoa, and algae. Because corals constitute only a small part of the total mass, the name coral reef, which so often is applied to them, is not especially appropriate (Cumings and Shrock, 1928b, p. 599).
>
> "The rock which composes the reef core is hard, gray to pink, ragged, porous dolomite that contains many pockets of calcite. Fossils that are found within the core are poorly preserved. The reef core is characterized by slickensides, many of which are inclined at angles of 45 to 65 degrees. Stylolites are developed along the slickensided surfaces and bedding planes and are the result of intraformational solution under the static pressure of the overlying rock after the solidification of the rock (Cumings and Shrock, 1927, p. 78). The visible parts of most of the reef cores do not exceed 75 feet in height and 300 feet in diameter. The core rock commonly is more resistant to erosion than is the surrounding rock.
>
> "The inclined beds which enclose the reef core constitute the fore-reef and often are referred to as the flank rock. The flank rock is typically yellowish-gray to pinkish limestone or dolomite. The dips in the fore-reef may be as much as 65 degrees at or near the reef core and decrease to 3 or 4 degrees or less on the periphery of the bioherm. Faults and slickensides are abundant in the beds of the fore-reef. Within a few hundred feet of the core, the beds of the fore-reef

interfinger with normal Mississinewa shale or Liston Creek limestone (Cumings and Shrock, 1928a, p. 142-144.(8).

The highest quality aggregate is probably located in the bigger, least weathered, and central part of reef-rock formations. The only limestone producer listed in the 1968 directory of limestone producers (2) is the Mill Creek Stone and Gravel Company near Richvalley. It has a capacity of 500 tons a day and is situated in the Huntington Lithofacies of the Wabash Formation in a reef deposit.

PHYSIOGRAPHY AND TOPOGRAPHY

Wabash County is located in north-central Indiana in the Eastern Lake and Till Plains sections of the Central Lowland province of the Interior Plains division of the United States (Fenneman). Two physiographic regions of Indiana (Malott) are represented within its boundaries. The section of the county south of the Wabash River is a part of the Tipton till plain, and the area to the north is the Steuben morainal lake section (Malott) and is part of the Northern Moraine and Lake region. An area of typical till plain between Wabash and Eel Rivers in Wabash County should be included in the Tipton till plain region. It has the physiographic characteristics of the till plain farther south and undoubtedly was formed under similar conditions (10).

Figure 4 shows a topographic map of Wabash County and Figure 5 shows a schematic sketch of the physiography of the county. The primary land forms in the county are the: (1) Packerton ridge

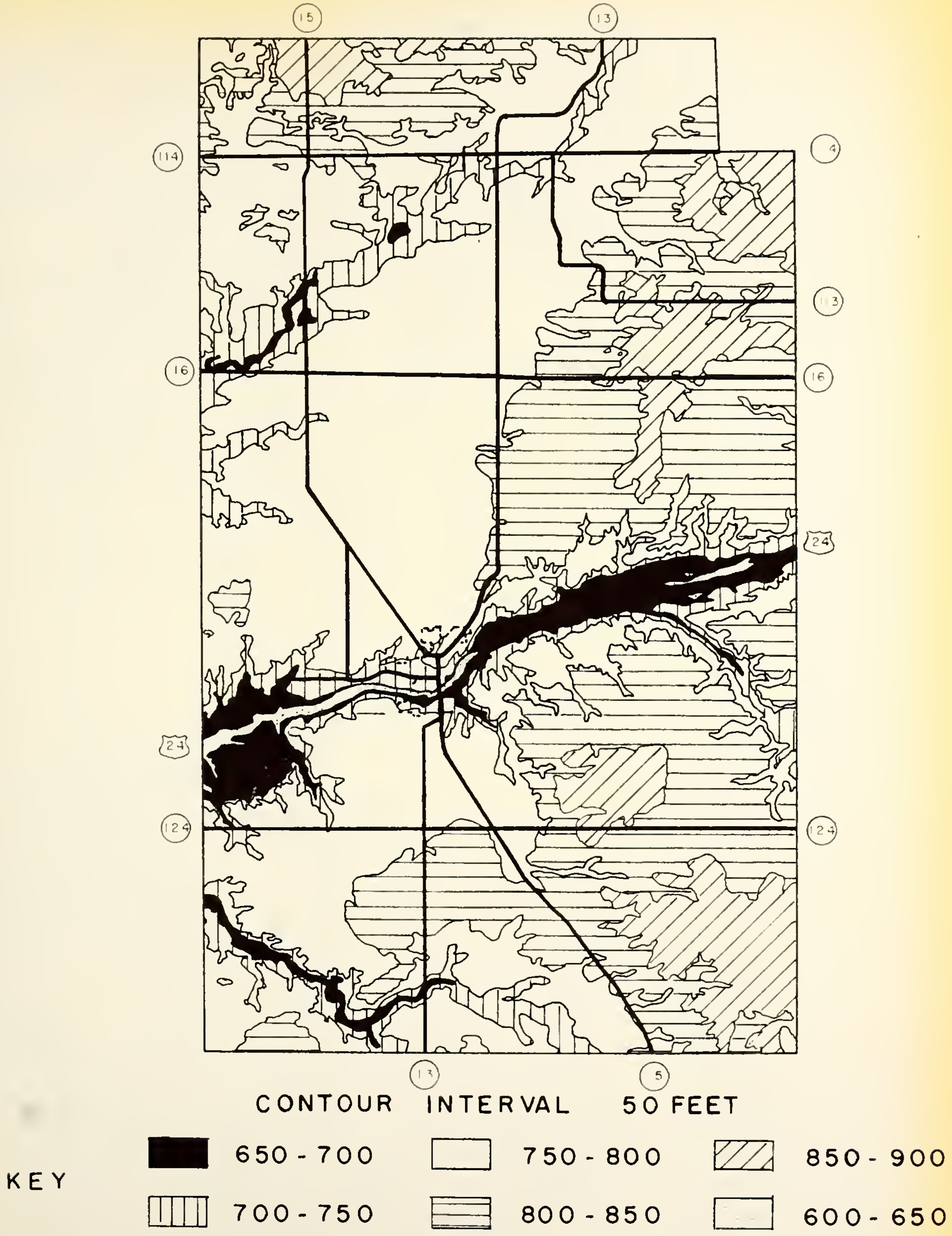


FIG. 4: TOPOGRAPHIC MAP OF WABASH CO.

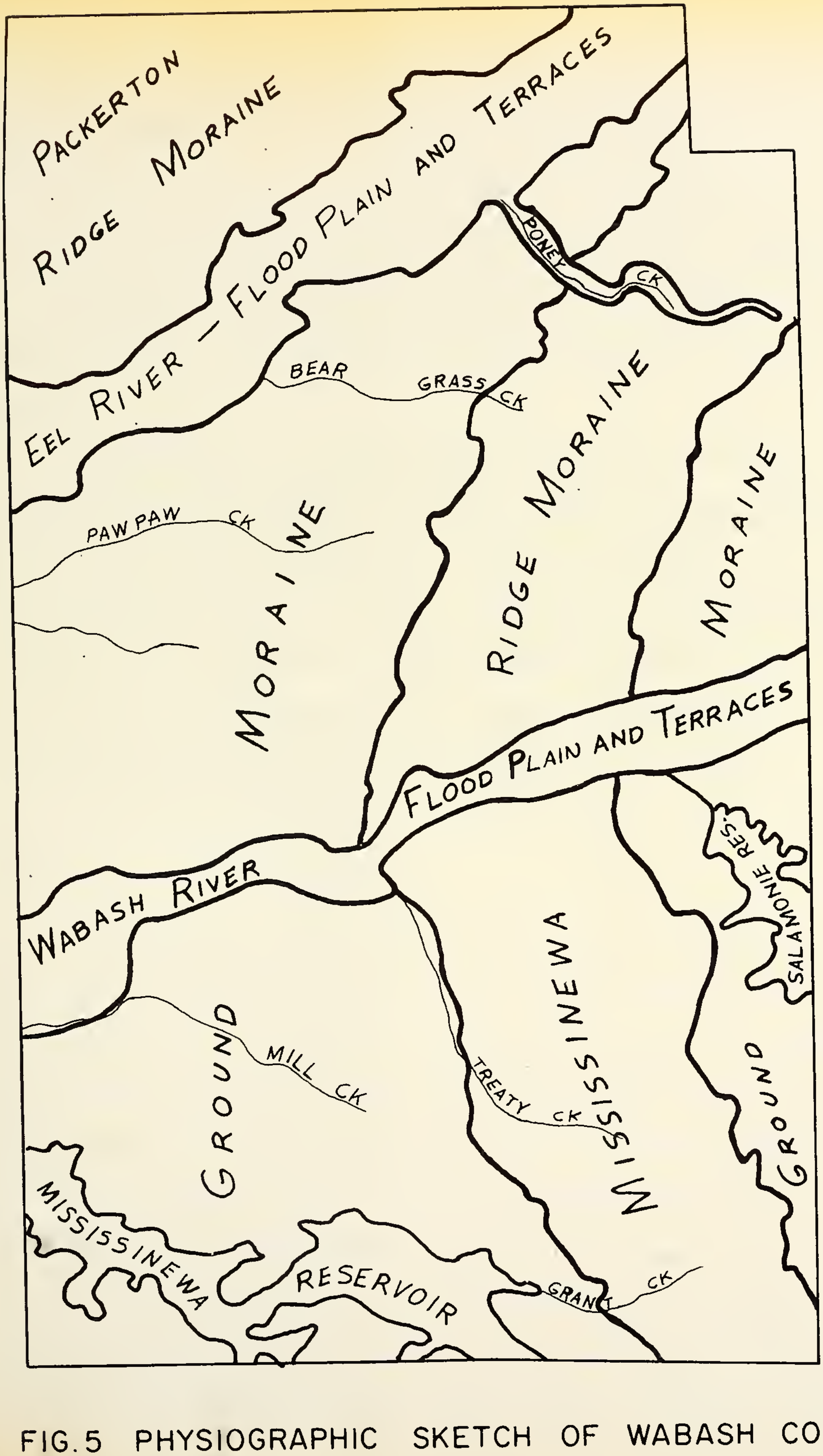


FIG. 5 PHYSIOGRAPHIC SKETCH OF WABASH COUNTY

moraine in the northwestern corner, (2) Eel River Valley flood plain and terraces, (3) ground moraine - the most extensive land form (4) Mississinewa ridge moraine and (5) the Wabash River Valley flood plain and terraces. The newly formed Mississinewa and Salamonie Reservoirs have claimed a substantial number of square miles in their respective valleys in the ground moraine areas.

The Wabash River Valley is the lowest area in the county. The river enters the county on the east side at an elevation of 669 feet and leaves the county on the west side at 634 feet. The valley ranges from a half mile wide, where it cuts through bedrock, to 2.5 miles wide on the western edge of the county where it cuts through glacial drift. The river has eroded a valley over 100 feet below the surrounding upland and local dissection has produced an area of rolling hills for one to two miles on each side of the valley.

The valley has three levels and they are most prominent in the eastern half. The lowest level is the flood plain; 15 to 20 feet above this is a terrace (rock bench) and 20 to 25 feet above this terrace is another terrace. Rock domes (the ancient reefs), some hundreds to several thousands of feet in diameter, and some several feet to several tens of feet high, are scattered through the valley mainly on the lower levels.

The mile or two of the Salamonie River, above its mouth is in a relatively deep and narrow valley. It is about 75 feet below the general upland and has near-vertical rock walls. The

Mississinewa Valley in Wabash County is now being flooded by the Mississinewa Reservoir.

The Eel River Valley, crossing the northwestern corner of the county shows considerable contrast to the Wabash River Valley. The Eel Valley is considerably wider, shallower, and has much flatter terrace and valley-wall slopes. Presently there is no exposed bedrock along the valley. Terrace levels are very indistinct and undoubtedly much of the outer edge of the valley outwash material could better be described as outwash plain parent material. The outwash terrace material is correlated with the upper level terrace material of the Wabash Valley. Since the Eel Valley was a sluiceway for both the Packerton and Mississinewa moraines it developed considerable width so that the present Eel River (and flood plain) is an under-fit (under-sized) stream for the containing valley. The river enters the county at an elevation of 750 feet and leaves it at an elevation of 705 feet.

The extensive area of till plain (ground moraine) south of the Eel River has a very gently undulating surface -- it is about the flattest ground moraine in Indiana. The general elevation of the plain is about 790 feet.

The north-south trending Mississinewa ridge moraine has an average width of four miles and an average crest height of 60 to 80 feet. The forward edge (west edge) has a general elevation of 800 feet, the average crest elevation is 860 to 880 feet and the back edge (east) elevation is about 815 feet. Slopes rise gently to

the crests and the maximum crest heights are over 900 feet in some places.

The topography of the ridge moraine is gently rolling. There are few distinct ridges and closed depressions. Some of the few existing depressions hold enough water to be swampy but vegetation and drainage are eliminating these so-called fens. The crest of the moraine causes a drainage divide and heavy clay soil causes a relatively fine textured drainage pattern.

The gently undulating ground moraine to the east of the Mississinewa moraine has a general elevation of 25 to 30 feet above the ground moraine to the west. The eastern ground moraine area also contains a portion of the Salamonie Reservoir.

The Packerton ridge moraine has a hummocky topography and numerous small kames, eskers, lakes and swamps. In some places local relief is over 100 feet and the maximum elevation is about 930 feet.

CLIMATE OF WABASH, INDIANA

Wabash is located in Wabash County, approximately in the center of the northern half of Indiana. Many days are pleasant in the spring and fall, however, temperatures exceed 90 degrees on about 26 days in the summer and decline to zero or colder on 8 days in the winter. Rainfall of 36 inches is usually evenly distributed throughout the 12 months of the year furthering a diversified agriculture in the area.

Weather changes of a few days cycle come from the passing of low or high pressure centers, bringing some sudden changes in temperature, humidity, cloudiness and winds. In general, the high's bring lower temperatures, lower humidity and greater sunshine. An approaching low accompanies a rise in temperature, wind, humidity and commencement of rain. This activity is of diminished intensity in the summer, but thundershower activity increases beginning in the spring.

Wabash is fortunate in generally having an even distribution of precipitation throughout the year, a happy contrast to areas that have a "dry season". The table of monthly rainfall for the past years on the back side of this report gives an indication of the variation in rainfall that may be expected. The agriculture of the area is geared to take advantage of the high probability of regular rains.

Many days of the year have pleasant temperatures but in a mid-continental area large variation of temperatures in a season, and from summer to winter must be expected. In 30 years temperatures have ranged from -21 to 109 degrees.

Relative humidity is not measured at Wabash but climatology shows that the percentages vary from the 40's during a typical summer afternoon to the 90's just before dawn. In the winter, this range is from the 60's to the 90's.

Heavy fog, restricting visibility to 1/4 mile, occurs on about 10 days in an average year, mainly in the fall, winter and spring months. Snowfall averages about 5 inches a month in the winter. The season average is 21 inches.

Heating degree days in the above table provide a comparative number for calculating heating requirements between different places and different times. Fuel consumption for heating is proportional to degree day totals, so a month with twice the heating degree days of another month requires twice as much fuel for heating. Degree days for a single day are obtained by subtracting the mean temperature from 65 degrees.

Thunderstorms, including incidences of lightning and thunder, occur on about 42 days of the year, according to the climatology of the area. The average is about 8 a month in the late spring and early summer, and less than one a month in the winter. The thunderstorms are seldom so severe as to cause loss of life, property, or crops. Damage to property from high velocity straight winds generated by thunderstorms is most apt to occur in the spring months. Only 6 tornadoes are on record as having touched the county.

Winds blow most frequently from the southwest, however in one or two of the winter months the prevailing winds are often northwesterly. Some freezing rain or freezing drizzle is expected about 8 days a year, according to a study spanning 1939 through 1948.

The growing season (defined here as the number of days between the last spring and first fall temperature of 32 degrees) averages 160 days in length. The season is 181 days or more in 10% of the years, 171 days or more in 25% of the years, less than 149 days in 25% of the years, and less than 139 days in 10% of the years.

The sun shines throughout the year about 57% of the daylight hours. This percentage ranges from 40% in the winter to more than 70% in July. About 13 days of each fall month are nearly cloudless, about 7 days are partly cloudy and 11 are cloudy.

The Wabash River occasionally floods adjacent low lands. The present river gage located on State Road 15 Bridge would have recorded the five highest water marks as follows: 28.7 feet(March 26, 1913), 24.2(May 18, 1943), 23.0(January 4, 1950), 21.5(April 6, 1957), and 21.1(March 13, 1939). The zero of the river gage is 642.66 feet above mean sea level.

The area has never experienced death-dealing smogs or hurricanes.

Lawrence A. Schaal
Weather Bureau State Climatologist
Purdue University, Agronomy Department
Lafayette, Indiana

LATITUDE 40° 37' N.
LONGITUDE 85° 51' W.
ELEV. (GROUND) 712 Feet

U S DEPARTMENT OF COMMERCE, WEATHER BUREAU
IN COOPERATION WITH CITY OF WABASH
CLIMATOGRAPHY OF THE UNITED STATES NO. 20 --12

CLIMATOLOGICAL SUMMARY

STATION WABASH, INDIANA

MEANS AND EXTREMES FOR PERIOD 1933-1962

	Temperature (°F)							**	Precipitation Totals (Inches)								Mean number of days					
	Means			Extremes								Snow, Sleet						Temperatures				
																		Max.		Min.		
Month	Daily maximum	Daily minimum	Monthly	Record highest	Year	Record lowest	Year	Mean degree days	Mean	Greatest daily	Year	Mean	Maximum monthly	Year	Greatest daily	Year	Precip. .10 inch or more	90° and above	32° and below	32° and below	0° and below	Month
(a)	30	30	30	30		30		30	30	30		30	30		30		10	30	30	30	30	
Jan.	34.9	18.7	26.8	70	1950	-15	1961+	1159	2.48	2.60	1950	5.1	12.4	1939	8.0	1927	5	0	12	27	3	Jan.
Feb.	37.5	20.3	28.9	70	1957	-14	1933	1011	2.18	2.70	1959	5.6	14.6	1962	8.0	1960	4	0	8	25	2	Feb.
Mar.	46.6	28.1	37.4	82	1945	-12	1960+	868	2.73	2.39	1939	3.4	10.2	1934	7.5	1931	7	0	.4	23	1	Mar.
Apr.	60.5	38.6	49.6	90	1942	10	1957	465	3.49	2.14	1959	.4	4.0	1961+	4.0	1961+	8	*	*	9	0	Apr.
May	72.4	48.8	60.6	93	1934	25	1954+	193	3.76	2.85	1944	T	T	1947	T	1947	8	1	0	2	0	May
June	82.1	58.9	70.5	104	1934	32	1956	36	4.17	2.70	1958	0	0		0		7	6	0	0	0	June
July	86.4	62.9	74.7	109	1936	42	1947	6	3.58	4.27	1955	0	0		0		7	9	0	0	0	July
Aug.	84.6	58.7	71.7	103	1934	40	1962	9	3.74	3.64	1933	0	0		0		6	7	0	0	0	Aug.
Sept.	76.2	50.9	63.6	102	1939	25	1942	102	2.74	4.29	1950	0	0		0		5	3	0	1	0	Sep.
Oct.	66.7	42.1	54.4	90	1949	19	1960+	350	2.87	2.50	1944	T	T	1962+	0.2	1929	5	0	0	6	0	Oct.
Nov.	49.5	31.3	40.4	86	1950	- 3	1950	747	2.74	3.34	1936	1.7	11.5	1950	11.0	1932	6	0	2	19	*	Nov.
Dec.	37.4	21.5	29.5	65	1946	-21	1960	1094	1.85	1.51	1948	5.2	15.3	1944	11.0	1929	4	0	9	24	2	Dec.
Year	61.2	40.1	50.7	109	July 1936	-21	Dec. 1960	6045	36.33	Sep. 4.29	1950	21.4	15.3	Dec. 1944	11.0	Nov. 1932	72	26	35	136	8	Year

(a) Average length of record, years.

T Trace, an amount too small to measure.

** Base 65°F

+ Also on earlier dates, months, or years.

* Less than one half.

TABLE II CLIMATE OF WABASH COUNTY

ENGINEERING SOIL AREAS

The soils of Wabash County can be divided into three major groups: (1) glacial or ice-contact deposits, (2) fluvial or water-deposited materials and (3) miscellaneous deposits. In the discussion that follows each of the major groups is further subdivided into land form-parent material groups. These groups are then subdivided into soil textural groups.

I. GLACIAL DEPOSITED MATERIALS

The land forms of glacial, or ice-contact deposits in Wabash County include ground moraines, ridge moraines, kames and eskers. The location and approximate size of most land forms is shown on the physiographic sketch (Fig. 5) and on the engineering soils maps and so these factors are not discussed below.

(1) Ground and Ridge Moraines of Clayey Texture

The Mississinewa ridge moraine, the eastern half of the Packerton moraine and all the ground moraine in the county have a moderately plastic to highly plastic parent material. Probably most of the parent material was deposited by the Erie Lobe which collected lacustrine clays from former glacial lakes in the northern part of Indiana and Ohio.

Wayne and Thornbury describe this till as follows:

> "The Cary till associated with the Mississinewa and later moraines is heavy-textured, dark gray, blocky and clayey. It commonly breaks with a nearly cubic fracture and when moist is much more plastic than the earlier till. Sand-size material is sparse throughout and few cobbles and boulders are present."(10)

Most always the clay component in each soil horizon predominates but occasionally one or the other of the horizons is found to be silty. Most soils classify as clays or clay loams. The clayey layers are either moderately plastic clays or highly plastic clays. Many of these clays (A-7 clays) are also elastic.
The clays are elastic for any one or all three of the following reasons: (1) the presence of one-size silt particles, (2) organic matter or (3) lime carbonate.

Pedologically the clayey soils are Blount, Morley and Pewamo. Though no samples were taken for engineering soil tests in Wabash County, engineering test data for these soil series, sampled in Allen and Delaware Counties, appears in the back of this report.

As previously mentioned the eastern slope of the Packerton moraine is also composed of the more plastic clay compared to the leaner clay on the western slope. Soil samples from the eastern slope of the Packerton moraine were obtained in Kosciusko County only several miles to the north. Test results on these soils are quoted below from the Kosciusko soils report.

> "A representative soil sample of the clayey moraine was obtained at site No. 22 about two miles northeast of Packerton. The surface soil consists of about 8 inches of friable sandy silt. Stiff clayey till with very little gravel lies below the surface soil. The B-horizon taken from 1 to 3 feet below the ground surface consists of 2.7% gravel, 19.2% sand, and 78.1% fines. It has a LL of 40.2% and PI of 21.6%. This clayey horizon is very weak in supporting power. It has a CBR value of 1.2 and is classified as CL or A-7-6 (14) soil. The parent material taken below 36 inches indicates less plasticity than the B-horizon. It is composed of 2.8% gravel, 29.0% sand and 68.2% fines. Both the LL and PI reduced to 24.6% and 11.0% respectively. Higher bearing capacity (CBR = 8.6) is also shown in this horizon. The parent material is classified as CL of A-6 (7)soil by the USCS and the BPR classification respectively.

> "From the distribution of the gravel pits as shown on the soils map the clayey southeastern slope of the Packerton moraine shows only one small pit located at Kinsey close to the southeastern border adjoining a muck deposit. On the northern slope of the moraine more gravel pits are located. Disregarding the fact that most of the gravel supplies of the county come from the outwash plains, the distribution of gravel pits within the Packerton moraine gives good indication of the difference in characteristic between the north and south sections as indicated on the engineering soils map".(12)

(2) Ridge Moraine of Silty Clay and Silty Texture

Most of the western half of the Packerton ridge moraine (northwestern corner of county) appears more silty and sandy and less clayey than the eastern side. The western side is also distinguished by numerous, relatively small kames and eskers, and also numerous swamps of various sizes.

Soils on the western side of the Packerton moraine in Wabash County are similar to soils on the western side in Kosciusko County where they were sampled and tested. The following soil test data is for three test sites about six miles north of the Wabash-Kosciusko line.

> "The typical soil sample was taken at site No. 23 located about one mile east of Claypool. The surface soils or topsoils (A-horizon) are about 12 inches in thickness. It is a loose sandy soil with little organic matter. Small stones and gravel are usually present. The B-horizon taken between 12 and 24 inches from the surface contains 5.0% gravel, 64.7% sand and 30.3% fines. It has a liquid limit (LL) of 13.6% but is non-plastic. The C-horizon taken from 2 to 3 feet below the surface reveals 5.7% gravel, 24.4% sand and 69.9% fines. The LL indicates an increase to 21.3% and a plastic index (PI) of 7.7%. The silty sand B-horizon has a stronger supporting power than the till C-horizon. It shows a CBR value of 15.0 while the C-horizon shows only 3.7.

> The subsoil (B-horizon) is classified as SM and A-2-4 by the USCS (Unified Soil Classification System) and BPR (Bureau of Public Roads) classification respectively. CL or A-4 (7) soil is the classification of the parent material of the area.
>
> "Another soil sample taken at site No. 24 about three and a half miles directly south of the previous site shows essentially the same parent material. However, the B-horizon is much less sandy than that of site No. 23. It has 3.9% gravel, 43.7% sand and 52.4% fines. The LL and PI are 25.8% and 8.8% respectively. It is classified as CL or A-4 (3) soil. Since this test site is close to the silty-clay morainic border or the crest of the Packerton moraine less granular subsoil can be expected.
>
> "Test site No. 3 is located west of Claypool in a depression. The water table was about 2 feet from the surface during the summer months. The B-horizon sample was taken at 3 feet from the surface. The dark colored soil shows 8.2% of gravel, 37.5% of sand and 54.3% of fines. It has a LL of 28.9% and a PI of 11.9% and is classified as CL or A-6 (4) soil. The parent material samples at 5 feet from the ground surface indicates more sand and less plasticity. It is believed to be the same as those at site No. 23."(12)

Pedologically most of these soils appear to belong to the Miami, Crosby and Brookston catena and additional engineering soils data are shown on Table III.

(3) Ridge Moraine of Silty Granular Texture

Small sections of the western portion of the Packerton moraine show signs of significant internal drainage. Parent material appears to be a silty and gravelly sand. Flowing water associated with the formation of the moraine undoubtedly deposited numerous layers or lenses of granular material all through the moraine. Occasionally these granular lenses are exposed at the surface by erosion or they are located in flatter areas around and associated with kames, eskers and lakes.

Pedologically the soils may belong to the Fox, Rodman, Ockley, Miami or Rawson series engineering soils data is found in the last chart of this report.

(3) Kames and Eskers - Sand and Gravel Texture

Essentially all the kames and eskers of mappable size in Wabash County are located in the northeast corner of the county and mainly in the Packerton moraine. The larger eskers shown on the map have been eroded and dissected so that they may be somewhat smaller than the map size indicated. The largest esker is located about 3½ miles west of North Manchester -- it has a maximum height of 40 feet and forms a discontinuous east-west ridge about 2½ miles long.

The parent material consists mainly of a slightly silty to a dirty sand and gravel. Usually there are about equal amounts of sand and gravel which are stratified and cross-bedded.

> "Crystaline rocks are more abundant in the northern part of the Packerton moraine then in the valley train deposits in the county. Such deleterious rocks as chert and shale are relatively scarce. The gravel makes satisfactory material for surfacing roads. The pit in the SW ¼ sec. 35, T. 30 N., R. 5 E., exposes a deposit in a kame, and, as is typical of such deposits, the gravel is poorly assorted and contains many boulders and much silt and clay". (10).

Pedologically the soils are Fox, Rodman and Ockley. Engineering soil test data for each of these soils is supplied in Table III.

II FLUVIAL DEPOSITED MATERIALS

The fluvial deposited materials of Wabash County are tabulated below according to their land form and parent material texture. Rock benches, though not fluvial deposits, form terraces along with sand and gravel terraces in the same stream valley and so are listed here.

Alluvial Plains
    Silt and Sand
Lacustrine Plain
(Slack water area on alluvial plain)
    Clay and Silt
Terraces
    Sand and Gravel
    Sand and Silt
    Rock (Benches)

(1) Alluvial Plains

The alluvial plain along the Wabash River is the largest flood plain area in the county. The Eel River alluvial plain is second largest in size. The attached soils map shows the Eel River flood plain to have a relatively narrow width (averaging several hundred feet) in a wide valley whereas the Wabash has a relatively wide flood plain (averaging several thousand feet) in a valley much narrower than the Eel River valley.

The next two largest flood plains, along the Mississinewa and Salamonie have been flooded by man-made reservoirs. Several other small flood plains are indicated on the map.

The flood plains are land forms that were constructed after glaciation. Rain and erosion has removed clay, silt and fine sand from the surrounding upland and redeposited mostly the silt and fine sand on the flood plain. Most of the finer clay material was carried on farther downstream.

Pedologically the soils are Genessee, Eel, Shoals and Sloan — engineering soils data can be found in Table III.

(2) Lacustrine Plain (Slack Water Area) - Clay and Silt Texture

On the west side of the county where the Wabash River came out of a bedrock channel onto unconsolidated glacial drift (preglacial Teays valley) it abruptly cut a very wide channel. The widened channel later caused a slack water lake where considerable clay and silt were deposited. Several drainage ditches have been cut through the area to promote drainage.

> "This area, formerly known as 'the prairie' has a black crumbly silty clay and clay surface soil which changes with depth to lighter-colored clay, in most places underlain by sandy or gravelly material at a depth ranging from 30 to 60 in. from the surface."(7)

Engineering properties of the Abington and Toledo slack water soils are found in Table III.

(3) Terraces - Silty Sand Texture

Wabash County has many square miles of terrace area along the Eel, Wabash, Mississinewa and the Salamonie Rivers and also along a number of smaller streams. It is unfortunate that most of the granular material underlying these terraces is primarily sand and in some cases bedrock. Where there are thick deposits of granular material it is usually assorted into numerous thin to thick layers of sand and much fewer and thinner layers (or lenses) of gravel. Most of the gravel is also of the smaller sizes. The fact that the "1968 Directory of Sand and Gravel Producers in Indiana" does not list one significantly large producer in Wabash County could be some indication of the aggregate quality. In 1951 Wayne and Thornbury, however, counted 80 active and abandoned pits

in the county possibly indicating there is plenty of low grade aggregate well distributed over the county.

In general, most of the deposits over the county can be classified as silty gravelly sand. Under the next heading several locations are given where the granular material may be more gravelly - as interpreted from the airphotos. The following two paragraphs by Wayne and Thornbury are quoted to provide information on aggregate mineral composition and distribution.

> "The most extensive valley train in the region is along the Eel River and consists of rounded and well assorted outwash gravels. Most of the pebbles are limestone and dolomite, but some shale is present. The overburden is thin and consists of weathered gravel and sand. Due to a relatively high water table, many of the pits in this area are wet operations. Similar outwash occurs along Poney Creek, which joins the Eel River at North Manchester. Gravel along a small tributary of the Eel River half a mile west of the town of Roann contains a higher percentage of crystalline material than is present along the Eel River."
>
> "Gravel deposits are found in the bluffs along the Wabash River where it crosses buried sluiceways, but a thick till overburden has prevented extensive exploitation. A gravel pit south east of Wabash is in outwash along Treaty Creek and the western edge of the Mississinewa moraine. Flat terrace remnants above the Wabash Valley flood plain south of Richvalley are potential gravel sources. Small deposits occur in the terraces along Mill Creek and similar tributaries." (10)

Pedologically the soils are mainly Martinsville, Westland and Oshtemo. Engineering soils data are provided in Table III.

(4) Terraces - Sand and Gravel Texture

Several terrace areas appear that they might be more gravelly or cleaner than others. These locations are as follows:

(1) about four square miles on the Eel River terraces in the extreme northeastern corner of the county, (2) one square mile of area three miles southeast of Laketon in the Eel valley, (3) several flat topped terraces in the Wabash valley on the west edge of the county in the "prairie" area, (4) lower terraces on the east edge of the county (east of the shale bedrock benches shown on the engineering soils map), (5) downstream or behind some of the reef rock formations (rock forms a protective bulwark) in the eastern part of the Wabash valley and (6) the large terrace along the Mississinewa River in the central part of the county -- it will be flooded, however.

Pedologically the soils of the more granular areas are Fox, Rodman and Ockley. Engineering soils data for each is provided in Table III.

(5) Rock Benches (River Terraces)

Most of the rock benches are found along the Wabash River and along the Salamonie River. Along the Salamonie River there are a few near the mouth of the river but several others have been covered by reservoir water. The few along the Mississinewa River are, at this writing, being inundated.

The rock benches indicated in the engineering soils map have up to five feet of overburden on them. The overburden is primarily weathered sand and gravel and as such is useless for aggregate material.

Along the Wabash River, east of Lagro, the valley and rock benches are the widest. West of Lagro, to the town of Wabash, the valley and the rock benches become narrower. The relatively wide

width, from the eastern county line to the Town of Wabash, is due to relatively soft shale in the area. Shale also underlies the rock benches in this area. In contrast, the narrowest portion of the valley, with the narrowest rock benches, is found from the Town of Wabash to five miles west. In this area the river is cutting through the resistant, cherty, Liston Creek limestone formation -- the benches are underlain by the same material. The remaining western portion of the valley (2½ miles) has sand and gravel terraces.

III MISCELLANEOUS MATERIALS

(1) Peat, Marl and Muck

Essentially all the peat and muck deposits lie in the northern quarter of the county. Most are located in Packerton moraine and in the Eel River valley train. Many of the deposits have small lakes or ponds in their central areas. Some of the deposits are also known to have layers or lenses of marl (bog lime) of various thicknesses and depths below the surface. Marl is composed of calcium carbonate and clay and silt particles. Usually it is a light-gray plastic clay and contains as much as 50 percent water.

Pedologically the soils are mainly Carlisle, Rifle, Taws and Linwood muck - engineering soil data is provided in Table III.

(2) Sand Dunes

A few small, low sand dunes are located in the western portions of the Eel River valley and the Wabash River valley. They are mainly the Chelsea soils.

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Soil Series	Dep Sur Inc	Opt. MC %	LL %	PI %
Blount	0-1	23	34	11
(modal)	18-2	22	54	32
NESE 8, T22N, R10E	27-	18	36	16
R10E Delaware Co.				
Blount	0-6	22	39	13
NENW 9	19-3	23	53	27
T22N R11E	32-4	19	45	23
Delaware Co.				
Brookston	0-8	24	46	19
(modal)	31-5	18	43	21
SWNE 5.T23N R4E	59-6	10	23	9
Howard Co.				
Brookston	0-3	23	47	20
NENE 30, T 23N R4E	19-2	20	48	24
Howard Co.	44-6	12	22	6
Carlisle	0-1			
over 42" thick,	17-4	terials before suitable for construction.		
variable substrata				
Celina *	0-1	--	--	--
	12-3	--	--	--
	3	--	--	--
Crosby (modal)	0-1	24	33	10
SESE 24, T23N.	20-3	22	57	32
R4E. Howard Co.	41-4	12	27	11
Crosby (modal)	0-7	20	29	6
NWSW 23, T23N. R4E	12-1	22	54	30
Howard Co.	31-4	12	25	10

TABLE III ENGINEERING TEST DATA FROM HOWARD COUNTY OR FROM OTHER INDIANA COUNTIES

Soils marked * do not have test data up to January 1, 1965. Values for these soils are from
S.C.S. tables of estimated physical and chemical properties (Table III issued November 1964)

Soil Series	Depth from Surface Inches	Classifications			Percentage Passing Sieve				Max. Dry Density lb/cu. ft	Opt. MC %	LL %	PI %
		USDA	Unified	AASHO	#4	#10	#40	#200				
Blount	0-10	sil.	CL or OL	A-6(8)	100	100	97	93	96	23	34	11
(modal)	18-27	sic.	MH	A-7-5(19)	100	100	100	99	99	22	54	32
NESE 8, T22N, R10E	27-33+	sicl. (till)	CL	A-6(10)	100	99	98	97	106	18	36	16
R10E Delaware Co.												
Blount	0-6	sil.	CL or OL	A-6(9)	100	99	94	87	98	22	39	13
NENW 9	19-32	sic.	MH-CH	A-7-6(17)	100	98	96	89	98	23	53	27
T22N R11E	32-44	sicl.	CL	A-7-6(14)	98	95	91	85	104	19	45	23
Delaware Co.												
Brookston	0-8	sicl.	ML or CL,OL	A-7-6(13)	99	98	95	83	96	24	46	19
(modal)	31-51	sicl.	CL	A-7-6(13)	98	97	93	85	106	18	43	21
SWNE 5,T23N R4E	59-66	loam (till)	CL	A-4(5)	97	94	86	58	126	10	23	9
Howard Co.												
Brookston	0-3	sil. to sicl.	ML or CL,OL	A-7-6(13)	100	99	96	85	96	23	47	20
NENE 30, T 23N R4E	19-29	sicl.	CL	A-7-6(15)	100	99	98	92	102	20	48	24
Howard Co.	44-60	loam to cl.	ML - CL	A-4(5)	99	95	84	62	120	12	22	6
Carlisle	0-17	Muck	Pt		No engineering values for mucks							
over 42" thick,	17-45	Muck	Pt		Must be removed and backfilled with select materials before suitable for construction.							
variable substrata												
Celina *	0-12	sil.	ML	A-4	100	100	90-95	85-95	--	--	--	--
	12-36	sicl.	CL	A-6	100	95-100	85-95	80-95	--	--	--	--
	36+	loam till.	ML or CL	A-4 or A-6	100	95-100	70-80	60-70	--	--	--	--
Crosby (modal)	0-10	sil.	ML - CL	A-6(8)	99	98	94	85	96	24	33	10
SESE 24, T23N,	20-31	sicl.	CH	A-7-6(19)	--	100	98	94	98	22	57	32
R4E Howard Co.	41-48	loam (till)	SC	A-6(3)	86	81	73	47	124	12	27	11
Crosby (modal)	0-7	sil.	ML - CL	A-4(8)	100	99	95	85	103	20	29	6
NWSW 23, T23N, R4E	12-17	sicl.	CH	A-7-6(19)	--	100	99	98	100	22	54	30
Howard Co.	31-42	loam (till)	CL	A-4 or A-6(5)	95	90	82	58	123	12	25	10

Soil Series	Dept Surf Inch	Opt. MC %	LL %	PI %
Eel Variable *	0-1	--	--	--
Substrata	10-3	--	--	--
below 30"	3	--	--	--
Fincastle *	0-1	--	--	--
	14-3	--	--	--
	32-6	--	--	--
	6	--	--	--
Fox	3-1	16	28	6
SENW 11	21-2	17	48	21
T20N, R6E	29-3	13	46	20
Madison Co.	36-5	10	NP	NP
Fox	3-1	18	32	10
SWNW 16, T19N, R8E	23-3	16	36	16
Depth to gravel	34-4	16	47	19
nearly like Ockley	41-6	11	NP	NP
Genesee Composite of 3 samples. Owen Co. Sampled to from 42 to 74 inches	0-7	14-16	26-31	6-9
Hennepin *	0-8	--	--	--
	8-1	--	--	--
	1	--	--	--
Kendallville *	0-1	--	--	--
	10-3	--	--	--
	3	--	--	--
Kokomo *	0-1	--	--	--
	12-4	--	--	--
	42-5	--	--	--
Landes *	0-1	--	--	--
	12-3	--	--	--
	3	--	--	--
Linwood *	0-1			
Mineral soils variable	18-3	--	--	--
below mucks	3			

TABLE III (Continued)

Soil Series	Depth from Surface Inches	Classifications			Percentage Passing Sieve				Max. Dry Density lb/cu. ft	Opt. MC %	LL %	Pl %
		USDA	Unified	AASHO	#4	#10	#40	#200				
Eel Variable *	0-10	sil.	ML	A-4	100	100	95-100	85-95	--	--	--	--
Substrata	10-30	sil. or lt. sicl.	ML or CL	A-4	100	100	95-100	60-80	--	--	--	--
below 30"	30+	variable	ML, CL, SM	A-4 or A-2	100	90-100	70-90	40-80	--	--	--	--
Fincastle *	0-14	sil.	ML	A-4	100	95-100	95-100	85-95	--	--	--	--
	14-32	sicl.	CL	A-6	100	95-100	90-95	85-95	--	--	--	--
	32-60	cl.	CL	A-6	100	95-100	75-85	65-75	--	--	--	--
	60+	Loam	ML or CL	A-4	100	95-100	75-85	60-70	--	--	--	--
Fox	3-11	sil.	ML - CL	A-4(7)	99	98	88	69	109	16	28	6
SENW 11	21-29	sicl.	SM - SC	A-7-6(7)	83	76	57	48	104	17	48	21
T20N, R6E	29-36	Grav. cl.	SM - SC	A-2-7(1)	73	63	43	27	108	13	46	20
Madison Co.	36-50+	sand & gravel	SW - SM	A-1-6(0)	68	55	20	6	132	10	NP	NP
Fox	3-11	sil.	ML - CL	A-4	100	100	96	82	103	18	32	10
SWNW 16, T19N, R8E	23-34	sicl.	CL	A-6	95	90	75	58	110	16	36	16
Depth to gravel	34-41	gravel. cl.	SM - SC	A-2-7	64	53	35	26	108	16	47	19
nearly like Ockley	41-60+	sand & gravel	GW	A-1	50	28	8	5	127	11	NP	NP
Genesee Composite of 3 samples Owen Co. Sampled to from 42 to 74 inches	0-74	sil. & loam	ML - CL	A-4(8)	100	99-100	98-100	74-92	111-114	14-16	26-31	6-9
Hennepin *	0-8	loam	ML	A-4	100	95-100	80-100	60-70	--	--	--	--
	8-18	cl.	CL	A-6	100	95-100	80-95	65-75	--	--	--	--
	18+	loam to cl.	ML or CL	A-4 or A-6	100	95-100	90-100	60-70	--	--	--	--
Kendallville *	0-10	loam	ML	A-4	100	95-100	70-80	60-70	--	--	--	--
	10-36	scl. or cl.	SC or CL	A-4 or A-6	95-100	90-100	90-100	35-70	--	--	--	--
	36+	loam to lt. cl.	ML or CL	A-4 or A-6	95-100	90-100	70-85	60-70	--	--	--	--
Kokomo *	0-12	sicl.	CL	A-6 or A-7	100	95-100	90-100	80-90	--	--	--	--
	12-42	cl. to sicl.	CL or CH	A-7	100	95-100	95-100	75-90	--	--	--	--
	42-50+	loam	ML or CL	A-4 or A-6	100	85-95	75-85	55-70	--	--	--	--
Landes *	0-12	fsl	SM	A-2	100	100	85-95	25-35	--	--	--	--
	12-30	sl. or lfs	SM	A-2	100	100	85-95	15-25	--	--	--	--
	30+	sl., lfs., or loam	SW or SM	A-3	95-100	95-100	80-90	10-25	--	--	--	--
Linwood *	0-18	muck	Pt		No engineering values for mucks.							
Mineral soils variable	18-38	silt loam	ML or CL	A-4 or A-6	100	95-100	90-100	70-80	--	--	--	--
below mucks	38+	loamy mineral soil										

Soil Series	Dept Surf Inch	Opt. MC %	LL %	PI %
Mahalasville *	0-1	--	--	--
	14-3	--	--	--
	30-5	--	--	--
	5	--	--	--
Miami (modal)	0-7	21	27	4
NWSE 29.T24N, R4E	11-2	15	36	19
Howard Co.	27-4	10	16	2
Miami	0-7	19	32	10
NWNE 8 T24N, R4E	7-1	17	37	17
Howard Co.	32-5	10	22	9
Morley (modal)	0-1	18	32	7
NENE 31 T30N. R12E	16-2	21	46	19
Allen Co.	2	17	33	13
Morley (composite of	0-1	14-24	28-47	6-15
5) 3 Allen Co., 2	10-3	19-22	40-55	19-31
Delaware Co.	21-6	13-17	29-44	13-24
Needham *	See			
Ockley (modal)	0-7	16	26	9
SWSW 35. T13N, R5E	27-3	18	60	42
Shelby Co.	46-6	8	NP	NP
Ockley (composite of	0-8	16	26-32	9
modal and SWNE 14, T13N,	16-3	16-18	47-60	27-42
R5E	4	8-12	NP	NP
Pewamo (modal)	0-6	25	50	18
NWSW 9, T22N, R10E	19-3	16	49	28
Delaware Co.	45-5	13	38	13
Pewamo (composite of 5)	0-2	20-22	37-44	11-27
3 Allen Co., 2	6-6	16-20	37-52	18-33
Delaware Co.	32-9	13-20	24-42	10-24
Rifle	0-4			
over 42" acid		terial before suitable for construction.		
fibrous peat				
Rodman *	0-7	--	--	--
	7-1	--	--	--
	1	--	--	--

TABLE III (Continued)

Soil Series	Depth From Surface Inches	Classifications			Percentage Passing Sieve				Max. Dry Density lb/cu. ft	Opt. MC %	LL %	PI %
		USDA	Unified	AASHO	#4	#10	#40	#200				
Mahalasville *	0-14	sicl.	CL or OL	A-6	100	95-100	90-100	80-90	--	--	--	--
	14-30	sicl.	CL	A-6 or A-7	100	95-100	90-100	80-90	--	--	--	--
	30-55	acl. or cl.	SC or CL	A-2 or A-6	100	95-100	85-95	30-95	--	--	--	--
	55+	stratified sand & silt	ML	A-4	100	95-100	95-100	90-100	--	--	--	--
Miami (modal)	0-7	sil.	ML - CL	A-4(8)	99	98	95	84	101	21	27	4
NWSE 29, T24N, R4E	11-20	c.l.	CL	A-6([illegible])	99	95	87	64	114	15	36	19
Howard Co.	27-48	loam (till)	ML	A-4(4)	94	88	77	53	128	10	16	2
Miami	0-7	sil.	ML - CL	A-4 or A-6	100	99	97	86	105	19	32	10
NWNE 8 T24N, R4E	7-17	c.l.	CL	A-6(9)	98	92	86	65	110	17	37	17
Howard Co.	32-56+	loam (till)	SC	A-4(3)	92	86	76	49	131	10	22	9
Morley (modal)	0-10	sil.	ML - CL	A-4(8)	--	100	97	85	106	18	32	7
NENE 31, T30N, R12E	16-25	sicl.	ML - CL	A-7-6(12)	--	100	97	77	101	21	46	19
Allen Co.	29+	sicl. (till)	CL	A-6(9)	--	100	94	81	112	17	33	13
Morley (composite of	0-10	sil.	ML to CL	A-4 & A-6	99-100	98-100	93-97	75-85	93-108	14-24	28-47	6-15
5) 3 Allen Co., 2	10-34	sicl. or clay	CL & CH	A-6 & A-7-6	99-100	92-100	88-98	77-87	99-105	19-22	40-55	19-31
Delaware Co.	21-60+	Sicl. (till)	CL	A-6 & A-7-6	86-100	83-100	76-96	65-85	108-120	13-17	29-44	13-24
Needham *	See estimated values for Mahalasville											
Ockley (modal)	0-7	sil.	CL	A-4(5)	99	99	90	60	113	16	26	9
SWSW 35, T13N, R5E	27-35	sicl.	SC	A-7-6(9)	84	82	62	45	107	18	60	42
Shelby Co.	46-60	gravel & sand	SP - SM	A-1-a(0)	58	44	25	8	135	8	NP	NP
Ockley (composite of	0-8	sil.	CL or OL	A-4	96-99	94-99	85-90	54-60	109-113	16	26-32	9
modal and SWNE 14, T13N,	16-35	c.l.	SC	A-7-6	84-88	77-82	41-62	38-45	107-110	16-18	47-60	27-42
R5E	46+	sand & gravel	SP - SM or SM	A-1 to A-2-4	58-92	44-83	25-44	8-15	117-135	8-12	NP	NP
Pewamo (modal)	0-6	sicl.	CH	A-7-6(13)	100	99	98	90	94	25	50	18
NWSW 9, T22N, R10E	19-34	sicl. or sic.	ML - CL	A-7-6(17)	99	98	96	88	111	16	49	28
Delaware Co.	45-56+	sicl.	CL	A-6(11)	94	90	84	72	114	13	38	19
Pewamo (composite of 5)	0-24	sicl.	ML to CL or OH	A-7-6	100	99-100	96-98	81-90	99-103	20-22	37-44	11-27
3 Allen Co., 2	6-60	sicl.	CL to CH	A-7-6	98-100	98-100	95-98	81-88	101-111	16-20	37-52	18-33
Delaware Co.	32-96	sicl. (till)	CL	A-7-6 & A-6	94-100	90-100	84-96	72-85	106-117	13-20	24-42	10-24
Rifle	0-42+	Peat	Pt	None	No engineering values for peats and mucks.							
over 42" acid		variable			Must be removed and backfilled with select material before suitable for conatruction.							
fibrous peat		substrate										
Rodman *	0-7	gravelly loam	ML	A-4	70-80	70-80	65-75	50-60	--	--	--	--
	7-12	grav. loam to cl.	CL	A-6	75-80	75-80	60-70	60-70	--	--	--	--
	12+	strat. sand & gravel	GP or SP	A-1	50-80	35-70	15-30	0-10	--	--	--	--

Soil Series	Dept Surf Inch	Opt. MC %	LL %	PI &
Russell *	0-1	--	--	--
	10-4	--	--	--
	40-5	--	--	--
	5	--	--	--
Shoals *	0-4	--	--	--
Layers of sand & silty sand below 40"	4	--	--	--
Sloan sil. *	See			
Sloan sicl. *	0-1	--	--	--
	15-3	--	--	--
	36-5	--	--	--
	5	--	--	--
Tawas 12-42"	0-2			
thick on sand	2	terial before suitable for construction.		
Westland	4-1	18	48	25
SWSE 26, T12N, R6E	21-4	18	44	27
Shelby Co.	50-6	8	NP	NP
Whitaker *	0-1	--	--	--
	10-3	--	--	--
	32-5	--	--	--
	5	--	--	--
Xenia *	0-1	--	--	--
	12-3	--	--	--
	36-4	--	--	--
	4	--	--	--

TABLE III (Continued)

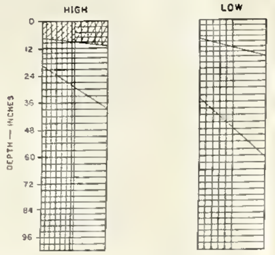
Soil Series	Depth from Surface Inches	Classifications			Percentage Passing Sieve				Max Dry Density Lb/cu. ft	Opt. MC %	LL %	PI &
		USDA	Unified	AASHO	#4	#10	#40	#200				
Russell *	0-10	sil.	ML	A-4	100	100	95-100	85-95	--	--	--	--
	10-40	sicl.	CL	A-6	100	100	90-100	80-90	--	--	--	--
	40-50	cl. to loam	CL or ML	A-6	100	95-100	75-85	70-80	--	--	--	--
	50+	loam till	ML or CL	A-4 or A-6	100	85-95	70-80	60-70	--	--	--	--
Shoals *	0-40	sil.	ML or OL	A-4	100	95-100	95-100	85-95	--	--	--	--
Layers of sand & silty sand below 40"	40+	sil. & layers of sand & s.l.	ML	A-4	100	95-100	90-100	75-85	--	--	--	--
Sloan sil. *	See estimated values for Shoals											
Sloan sicl. *	0-15	sicl.	CL or OH	A-6	100	95-100	90-100	85-95	--	--	--	--
	15-36	sicl.	CL	A-6	100	95-100	90-100	85-95	--	--	--	--
	36-55	sicl. to scl	CL	A-6	100	95-100	85-95	50-80	--	--	--	--
	55+	variable	ML or CL	A-4 or A-6	95-100	90-100	80-90	50-90	--	--	--	--
Tawas 12-42"	0-25	Muck			No engineering values for mucks.							
thick on sand	25+	loamy sand	SP or SM	A-1 or A-3	Must be removed and backfilled with select material before suitable for construction.							
Westland	4-11	sicl. or loam	SC	A-7-6(8)	97	90	73	49	105	18	48	25
SWSE 26, T12N, R6E	21-45	sicl.	CL	A-7-6(12)	95	90	79	60	109	18	44	27
Shelby Co.	50-60	sand & gravel	SP - SM	A-1b(0)	72	53	28	9	132	8	NP	NP
Whitaker *	0-10	sil.	ML	A-4	100	95-100	95-100	85-95	--	--	--	--
	10-32	sicl.	CL	A-6	100	95-100	90-100	85-95	--	--	--	--
	32-50	scl.	SC	A-2 or A-4	100	95-100	80-90	30-40	--	--	--	--
	50+	strat silt & sand	ML or SM	A-4	100	95-100	90-100	70-80	--	--	--	--
Xenia *	0-12	sil.	ML	A-4	100	95-100	95-100	85-95	--	--	--	--
	12-36	sicl.	CL	A-6	100	95-100	90-100	80-90	--	--	--	--
	36-48	cl.	CL	A-6	100	95-100	75-85	65-75	--	--	--	--
	48+	loam	ML or CL	A-4 or A-6	100	85-95	70-80	60-70	--	--	--	--

JHRP 70/9

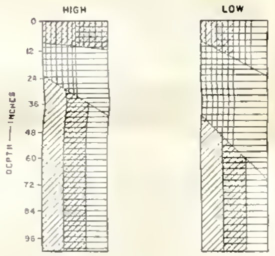
GENERAL SOIL PROFILES

RIDGE AND GROUND MORAINE

CLAYEY TEXTURE

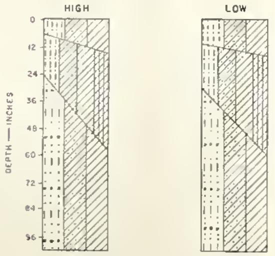


SILTY CLAY TEXTURE



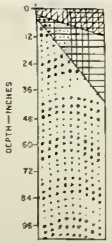
RIDGE MORAINE

SILTY GRANULAR TEXTURE



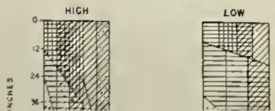
ESKERS AND KAMES

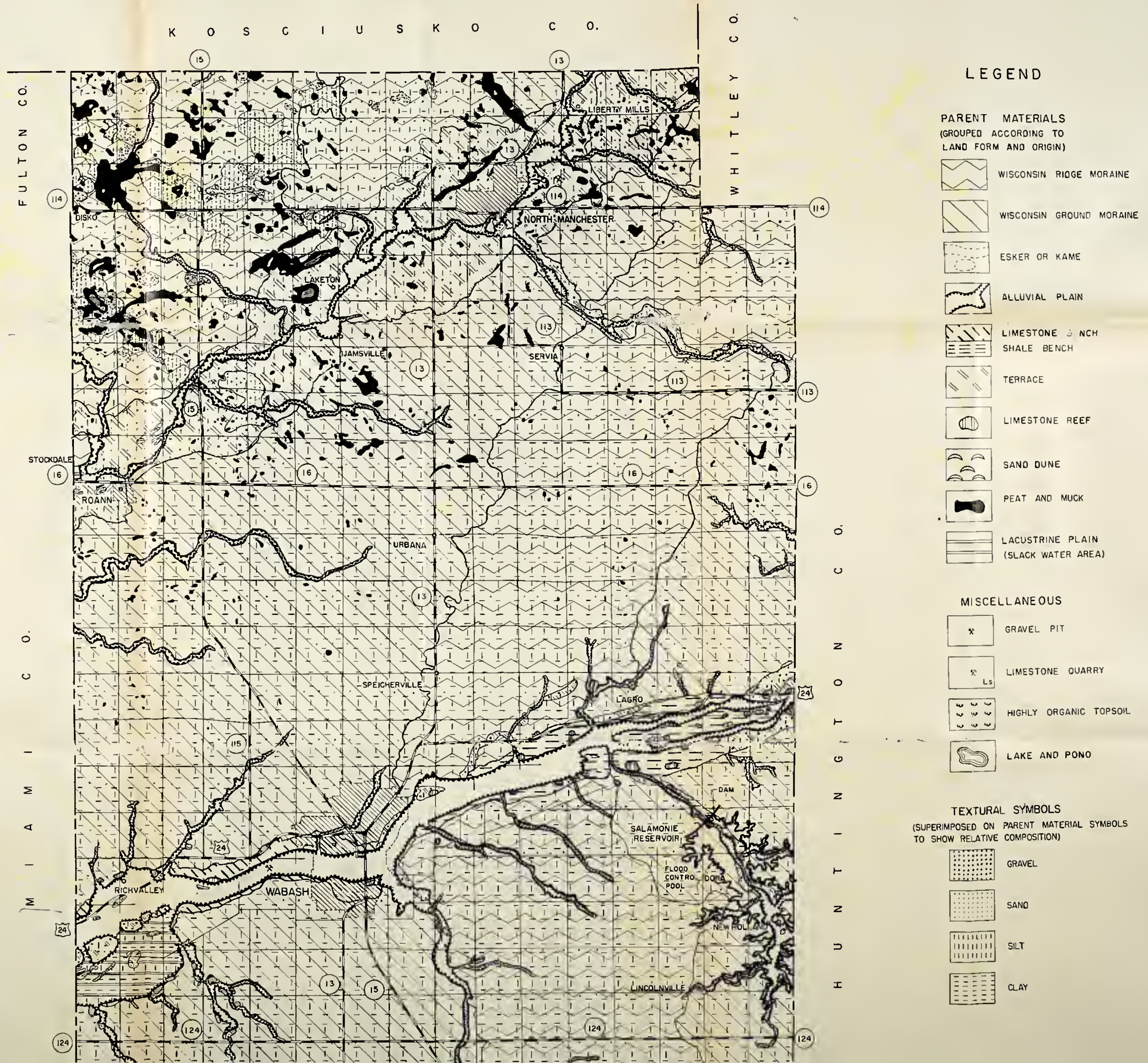
SAND AND GRAVEL TEXTURE

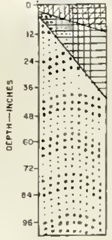


TERRACES

SANDY AND GRAVELLY

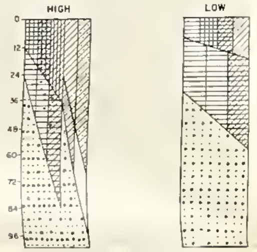




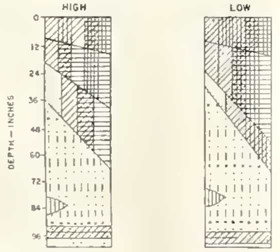


TERRACES

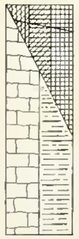
SANDY AND GRAVELLY



SANDY AND SILTY

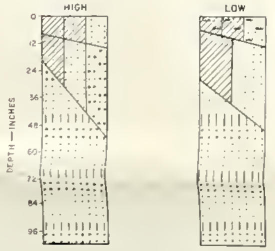


BEDROCK BENCHES

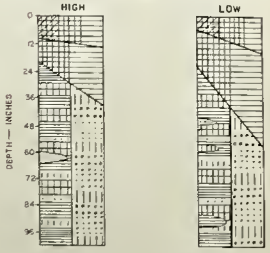


FLOODPLAINS

SILTY AND SANDY TEXTURE

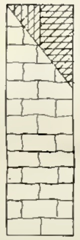


FLOODPLAIN – LACUSTRINE PLAIN
CLAYEY AND SILTY TEXTURE

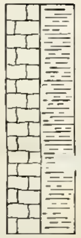


BEDROCK OUTCROPS

KLINTAR
EXHUMED REEFS

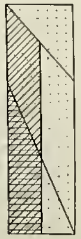


SCARPS
ROCK STREAM BANKS

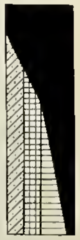


MISCELLANEOUS

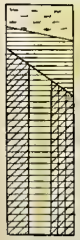
SAND DUNES

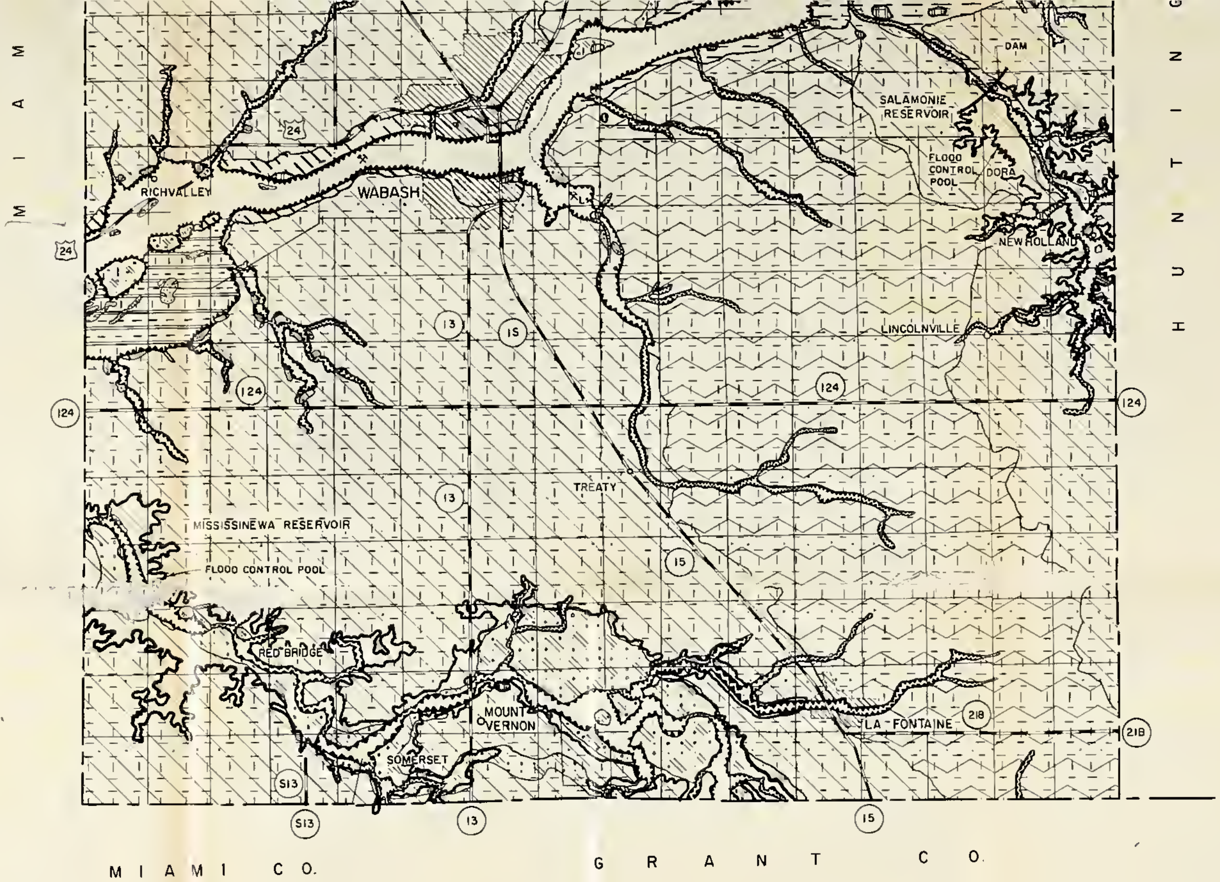


PEAT AND MUCK



HIGHLY ORGANIC TOPSOIL





▭ LAKE AND POND

TEXTURAL SYMBOLS
(SUPERIMPOSED ON PARENT MATERIAL SYMBOLS TO SHOW RELATIVE COMPOSITION)

- ▦ GRAVEL
- ░ SAND
- ▥ SILT
- ▤ CLAY

TEXTURAL SYMBOLS FOR SOILS PROFILES

- ▦ GRAVEL
- ░ SAND
- ▥ SILT
- ▤ CLAY
- ▨ LOAM
- ▦ LIMESTONE
- ▤ SHALE

ENGINEERING SOILS MAP

WABASH COUNTY

INDIANA

PREPARED FROM
1941 AAA AERIAL PHOTOGRAPHS
BY
JOINT HIGHWAY RESEARCH PROJECT, PURDUE UNIVERSITY
SPONSORED BY:
INDIANA STATE HIGHWAY COMMISSION
SOIL CONSERVATION SERVICE
AND
BUREAU OF PUBLIC ROADS

1970